

# PIPE PROTECTOR AND SUPPORT

## Related Applications

[0001] This application is a continuation-in-part of Application Serial No. 09/876,861 filed June 7, 2001, which claims the benefit under 35 U.S.C. § 119(e) of Application Serial No. 60/210,714 filed June 9, 2001.

## Field Of The Invention

[0002] This invention relates to a method and apparatus for protecting the end of a pipe.

## Background Art

[0003] When water pipes are installed in buildings the pipes often extend along a wall (upwards, downward, or sideways) and then bend and extend horizontally toward the inside of a room, away from the wall. Various connectors fasten to the ends of these pipes in order to hook up sinks, bathtubs, toilets, and other plumbing fixtures. Similar constructions occur with gas lines, electrical lines and tubes carrying other items.

[0004] In order to hold these various tubes at predetermined locations relative to structural supports, plumbing straps are used. These straps are typically elongated strips of metal that have large holes in them to accommodate plumbing pipes, with smaller holes to accommodate nails or screws to fasten the straps to building studs.

[0005] The ends of the pipes extend beyond the straps, into the room in which the plumbing fixtures are located, such as sinks, bathtubs etc. The distal ends of these pipes can be damaged, accidentally or intentionally. For example, when placing drywall over the pipes, the end of the pipes may be forced into the drywall in order to mark the pipe location on the drywall so that holes can be cut for the pipes. The damage to the pipes impairs the later use of the pipes. There is thus a need for a protector to be used.

[0006] During construction, dirt, debris, and airborne particles can enter the distal, open end of the pipes. These unwanted particles usually enter accidentally, but sometimes children or mischievous persons place the particles in the open ends of the pipes. These unwanted particles or liquids also hinder later use of the pipes. Further, unwanted particles sometimes pass beyond the bend in the pipes and fall down into the pipe where removal is difficult or impossible. If not removed before the plumbing fixtures are connected, the particles may damage or impede the

function and performance of any plumbing fixtures connected to the pipes through which the residual particles and damage valve seats in plumbing fixtures. There is thus a need for a suitable protector.

[0007] Finally, during construction it is common to pressure test the pipes before the construction is accepted by the customer. This pressure testing can be done by installing the plumbing fixtures on the distal ends of the pipes and flowing pressurized water through the system. But if there is a leak it is sometimes necessary to remove the plumbing fixtures to get access to the pipes, and that is cumbersome, time consuming and expensive. There is thus a need to test such pipes before the plumbing fixtures are attached.

[0008] The plumbing straps are typically thin so they can fit between a stud and the adjacent wall covering, such as drywall. That results in a plumbing pipe being supported by a thin metal strip that can abrade the pipe and that can produce an undesirably concentrated area of loading when counteracting any lateral force applied on the pipe. These effects can be exacerbated because the holes for the pipes are typically punched out, which can leave a sharp edge on the hole. Additionally, some pipes are soldered or glued to the strap, and the thin strip of metal provides a narrow area of support for the solder or adhesive. Further, it is usually desirable to retain the pipe in a perpendicular relationship to the strap while it is being bonded or soldered in place, and the installer may rely on the strap to retain the pipe. A thin strap, with a simple round opening having suitable clearances for tolerances and adhesive or solder, may not adequately and steadily support the pipe in this perpendicular relationship, thereby resulting in inconvenience to the installer or resulting in compromised results. Similar problems occur if the tubes are something other than plumbing pipes.

[0009] There is thus a need for an improved support for tubes that provides an increased area for supporting a tube held by the support, and for providing an increased area for bonding to the tube carried by the support. There is a further need for providing such an improved support at a low cost.

### **Summary of Invention**

[0010] An improved plumbing strap is described first, followed by an improved pipe protector that cooperates with the improved strap, or that cooperates with other straps.

[0011] Holes are formed in an elongated strap. The holes have an undulating edge around

the periphery of the hole which causes the edge to extend on both sides of a plane containing the strap. The undulations are achieved by forming a plurality of bends that extend outward, preferably radially outward, from the periphery of the hole

[0012] In particular, a support is provided for tubular members where the support has at least one opening sized to receive and support the tubular member. The opening has a periphery forming an edge to support the tubular member. The support has an undulation on the edge of the opening causing the edge to extend on opposing sides of the support. Advantageously the support comprises an elongated, flat strap having a plurality of openings with the defined undulating edges. The support preferably comprises one of a T-shaped support, an L-shaped support, an elongated strap, and a strap long enough to extend between adjacent studs of a house.

[0013] Advantageously the support has a plurality of holes sized to receive a fastener to fasten the support to a structural support. Preferably, the undulations are formed by a plurality of flutes having an apex outward of the periphery of the opening and an enlarged base forming a portion of the opening. Ideally, the undulations are formed by predominantly curved segments to reduce stress concentrations in the support, but the undulations could be formed by triangular shaped flutes having an apex outward of the periphery of the opening with an enlarged end forming a portion of the opening. Preferably, the undulations are formed by at least six flutes each having an apex outward of the periphery and a base forming part of the periphery, the bases of the flutes having distal ends that abut each other.

[0014] There is also preferably provided a plumbing strap having a strip of material with a flat portion in which is placed at least one fluted opening having a periphery that undulates onto opposing sides of the flat portion, with at least four undulations. The fluted openings are advantageously formed by flutes having a triangular shape when viewed along an axis orthogonal to the strap. More preferably, there are an even number of flutes with adjacent flutes extending on opposing sides of the strap. Additionally, the flutes preferably have a longitudinal axis that is not perpendicular to an edge of the strap.

[0015] The present invention includes not only the strap, but the strap used in connection with tubing or pipes. Thus, the above embodiments are used with plumbing pipes, electrical conduit, or other elongated tubular members extending through the opening. Advantageously, there is a